FLORA OF THE HALOPHYTIC GRASSLANDS IN THE VALLE DE JANOS, CHIHUAHUA, MEXICO

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ABSTRACT

A study of the flora and plant endemism of the halophytic communities of the Valle de Janos, Chihuahua, was carried out. Documentation of the flora and endemic species was conducted by collecting plants throughout the area during a two-year period. The vascular plant diversity accounts for 57 families, 198 genera, and 328 taxa including infraspecific categories. Asteraceae (40 genera, 55 species), Poaceae (29, 60), Fabaceae (14, 28), and Euphorbiaceae (6, 22) are the most representative families in genera and species, respectively. *Euphorbia* (14 species), *Dalea* (8), *Bouteloua* (8), and *Opuntia* (7) are the most diversified genera. Fifteen of the species recorded are restricted to the Chihuahuan Desert; three of them are endemic to the State of Chihuahua, and only one species, *Dalea janosensis*, is restricted to the Valle de Janos halophytic communities. All species comprise five biological forms, and according to their origin, 96.5% of the genera and 92.1% of the species are authouchtonous; the rest of them are exotic.

KEY WORDS: Valle de Janos, Chihuahua, Mexico, endemism, halophytic communities

RESUMEN

Se estudió la flora y endemismo de las comunidades halófilas del Valle de Janos, Chihuahua. Para la documentación de la flora y endemismo se realizaron recorridos y colectas de material botánico en toda el área de estudio durante un periodo de dos años. La diversidad florística vascular está integrada por 57 familias, 198 géneros y 328 taxones incluyendo categorías infraespecíficas. Asteraceae (40 géneros y 55 especies), Poaceae (29, 60), Fabaceae (14, 28) y Euphorbiaceae (6, 22) son las familias más representativas respecto a número de géneros y especies. *Euphorbia* (14 especies), *Dalea* (8), *Bouteloua* (8) y *Opuntia* (7) son los géneros con mayor número de especies. Quince de las especies registradas están restringidas al Desierto Chihuahuense, tres de ellas son endémicas del Estado de Chihuahua, y sólo una especie, *Dalea janosensis*, está restringida a las comunidades halófilas del Valle de Janos. Todas las especies comprenden cinco formas biológicas principales. De acuerdo con su origen, 96.5% de los géneros y 92.1% de las especies son autóctonos, el resto son exóticos.

PALABRAS CLAVE: Valle de Janos, Chihuahua, Mexico, endemismo, comunidades halófilas

INTRODUCTION

Halophytic communities are common within the Chihuahuan Desert region of northern Mexico (Henrickson & Johnston 1997), which are mainly comprised of the families Poaceae, Chenopodiceae, Frankeniaceae, and Asteraceae (Rzedowski 1978). These associations constitute an important part of the grasslands, since they are restricted to specific environmental conditions (Herrera 2012), such as species adapted to soils with high salt concentrations, basic pH, silty-clay texture, and poor drainage (Rzedowski 1978; Gay & Dwyer 1980). The edaphic factor is the main determinant in the plant composition in these communities (Miranda & Hernandez-X 1963), which are frequently located at the bottom of closed drainage basins that retain water and intermountain valleys (Rzedowski 1978).

The Valle de Janos communities have these characteristics, but also, support extensive areas of arid grasslands and associated shrublands composed mainly of mesquite (*Prosopis glandulosa* var. *torreyana*) and ephedra (*Ephedra trifurca*) (COTECOCA 1978; Royo & Báez 2001). Valle de Janos is located in the Chihuahuan Desert ecoregion at the northwestern portion of the State of Chihuahua.

The arid zones in northern Mexico support a high number of endemic plant species (González-Medrano & Chiang 1988; Rzedowski 1991). Its flora and vegetation are of particular interest since they are adapted to specific environmental conditions (Kliem 2000). However, this large region is among the most unknown from a floristic viewpoint (Rzedowski 1992). Several studies of the halophytic communities in northern Mexico have been completed (Johnston 1939), including areas in the State of Chihuahua such as Babícora (Estrada et al. 1997), the central part of Chihuahua (Estrada & Villarreal 2010), Cañón de Santa Elena (SEMARNAT 1997), Campo Experimental La Campana (Royo & Melgoza 2001), Samalayuca (Enríquez 2003), and Presa la Boquilla (González 2005). Undoubtedly, the most important one is the flora of the Chihuahuan Desert (Henrickson & Johnston 1997), where almost 150 of the species cited occur in the halophytic communities of Valle de Janos, highlighting those belonging to the families Asteraceae and Chenopodiacaeae. Valle de Janos is of great importance for natural resource conservation in Mexico and North America (List et al. 2000; Manzano-Fischer et al. 2000), and therefore is a North American Grassland Priority Conservation Area (GPCA) (Karl & Hoth 2005). The National Commission for the Knowledge and Use of Biodiversity (CONABIO) has also identified it as a Priority Terrestrial Region (RTP-45) (Arriaga 2000) and an important Area for Bird Conservation (AICAs-45) (CIPAMEX-CONABIO 1999). Valle de Janos is also part of the complex of priority areas in the Chiricahua-Peloncillo-Sierra Madre for the conservation of wildlife (Dinerstein et al. 2000). It is noteworthy that Valle de Janos has the largest colony of the black-tailed prairie dog (*Cynomys ludovicianus* Ord.) (Ceballos et al. 1993) in North America, which is an endangered species (SEMARNAT 2010). Nevertheless, this area has been impacted by anthropogenic activities that threaten the persistence of the endemic flora in these halophytic communities and the prairie dog populations. These communities have suffered a rapid decline as an ecosystem over the past 25 years (Ceballos et al. 2010). The main causes of deterioration include livestock overgrazing, expansion of mechanized agriculture (Ceballos et al. 1993, 2005), and climate change (Pinedo et al. 2013).

To date, there have been no studies that characterize the plant diversity or the ecology for the region. The aim of this study is to contribute to the knowledge of the regional flora and plant endemism in the halophytic communities in the Valle de Janos.

METHODS

Study area

The study area is about 116,000 ha and is located in the northwestern region of the State of Chihuahua, in the municipality of Janos, 30°54'23"N, 108°38'55"W and 30°53'51"N, 108°13'58"W (Fig. 1). The annual rainfall is 306.7 mm with almost 50% of it occurring between July and September. The mean temperature is 16°C (Rzedowski 1978). The altitude is 1380–1500 m and the topography varies from flat ridges to low round hills with gentle slopes of 1–8%. The main climate is BSoK type, corresponding to dry and temperate climates according to the Köpeen Classification System (modified by García 1973). The hydrology of the area belongs to the North Closed Basin Region, specifically to Río Casas Grandes Basin (CONAGUA 2009). According to the Guide for interpreting soils (INEGI 2004), INIFAP-CONABIO (1995) and INEGI (2005), the most outstanding soil in the Valle de Janos are Luvic Xerosol (with clay accumulation in the subsoil, traces of lime or gypsum, with very low and burdensome physical phase); Haplic Xerosol (with very low organic matter content and very permeable); Haplic Feozem (in flat or gently wavy relief, permeable); Haplic Yermozol (thin soil, poor in organic matter content, high content in calcareous material, permeable); Luvic Yermosol (with high clay content in the B horizon, and below this may have calcic or gypsic horizon); Orthic Zolonetz (clayey, with an alkaline, saline phase, waterproof, and poor in organic matter content); Orthic Solonchak (clay, high concentrations of soluble salts, poor in organic matter and nutrients content, with a sodium phase); Eutric Regosol (coarse texture, poor

Fig. 1. Study area. The Valle de Janos (darker shaded area) is located at the northwestern portion in the State of Chihuahua, and, it is the area where the largest colony of prairie dogs is located in North America.

in organic matter content, nutrient-rich subsoil, very permeable) and Lithosol (stony and very thin, in steep slopes).

The representative vegetation in the area is salt-tolerant grassland, extensive arid grassland, and microphyllous desert scrub (COTECOCA 1978; Rzedowski 1978) (Fig. 2). The most common shrub species in the microphyllous desert scrub are *Prosopis glandulosa* var. *torreyana, Ephedra trifurca, Opuntia imbricata*, *Mimosa aculeaticarpa*, and *Atriplex canescens.* Also, there are several dominant herbaceous elements such as *Gutierrezia sarothrae, G. microcephala*, *Chenopodium album*, *Muhlenbergia porteri*, *Salsola tragus,* and *Pleuraphis mutica*, while in the natural, undisturbed by agriculture or grazing grasslands, there are *Bouteloua* spp., *Aristida* spp., *Panicum* spp., and *Eragrostis* spp., plus other herbaceous species such as *Machaeranthera* spp., *Sida* sp., *Eriogonum* spp., and *Lepidium* spp. The halophytic grasslands are dominated by species adapted to poorly drained and saline soils, including *Pleuraphis muitca, Sporobolus airoides, Atriplex canescens,* and *Portulaca mundula.*

The study was carried out during the years 2011 and 2012. Specimen collecting was conducted in different seasons in order to document the phenological stages of species in all plant associations. All plants were properly georeferenced, recording the community or dominant association where the plants were found. Plant identification was made by using different monographs for the different genera as well as the *Flora of the Chihuahuan Desert* (Henrickson & Johnston 1997). Herbarium voucher specimens were deposited at ANSM (Saltillo, Coahuila, Mexico) and CFNL (Linares, Nuevo Leon, Mexico) herbaria.

Fig. 2. Habitat of *Pleuraphis mutica,* a dominat herbaceous element in a salt-tolerant grassland escosystem in the Valle de Janos, Chihuahua, México. Other dominates include *Prosopis glanduloso* var. *torreyana* and *Yucca elata*.

RESULTS AND DISCUSSION

Diversity

The flora of the Valle de Janos is represented by 57 families, 198 genera, and 328 species (including infraspecific categories) of vascular plants (Table 1, Appendix 1). Dicots include 50 families, 161 genera, and 259 species, while monocots are represented by five families, 35 genera, and 67 species. Gymnosperms and ferns are represented by only one species each. The families with the highest number of genera and species are Asteraceae (40, 55), Poaceae (29, 60), Fabaceae (14, 28), and Euphorbiaceae (6, 22), and the ten most diversified families include over half of the genera (122, 61.6%) and species (229, 69.8%) (Table 2). The most diversified genera are *Euphorbia* (14), *Dalea* (8), *Bouteloua* (8), *Opuntia* (7), *Aristida* (6), and *Atriplex* (5) (Table 3). According to the plant diversity in Mexico (304 families, 2,804 genera, and 23,424 species) (Villaseñor 2004), the State of Chihuahua encompasses 37.5% (152), 22.2% (890), and 8.1% (4,035) of the families, genera, and species, respectively. The flora of the Valle de Janos represents 18.8% of the families, 7.1% of the genera, and 1.4% of the species existing in Mexico, and represents 37.5%, 22.2%, and 8.1% of the families, genera, and species existing in the State of Chihuahua. The families with the highest diversity in genera and species in most of Mexico are Asteraceae, Poaceae, and Fabaceae (Rzedowski 1992; Villaseñor 2003, 2004), which in turn, have been used as predictors of diversity in this country (Villaseñor et al. 2007). The four genera of Valle de Janos (*Euphorbia*, *Dalea*, *Bouteloua,* and *Opuntia*) are also among the 17 most numerous genera of Mexico (Villaseñor 2004). According to Rzedowski (1992), the grasslands and shrublands support almost 6,000 species (20% of the total flora), and 5.5% of these species are found in the Valle de Janos.

Table 1. Division of the vascular flora recorded in the study area.

Groups	Families	Genera	Species	Infraspecific categories
Ferns	1	1	1	1
Gymnosperms	1	1	1	0
Angiosperms				
Dicotyledons	50	161	259	21
Monocotyledons	5	35	67	1
Total	**57**	**198**	**328**	**23**

Table 2. Families with the highest number of genera and species in the study area.

Family	Number of genera	Number of species
Asteraceae	40	55
Poaceae	29	60
Fabaceae	14	28
Malvaceae	7	13
Euphorbiaceae	6	22
Cactaceae	6	13
Solanaceae	6	12
Brassicaceae	6	9
Nyctaginaceae	4	9
Chenopodiaceae	4	8

Table 3. Genera with the highest number of species in the study area.

Genera	Number of species
Euphorbia	14
Dalea	8
Bouteloua	8
Opuntia	7
Aristida	6
Atriplex	5
Muhlenbergia	5
Sporobolus	5
Asclepias	4
Astragalus	4

Valle de Janos has lower species diversity than other halophytic community areas found in the State of Chihuahua, such as the center of the State of Chihuahua (Estrada & Villarreal 2010), La Campana Experimental Ranch (Royo & Melgoza 2001), and Laguna de Babícora (Estrada et al. 1997). This difference is related to the other plant associations present in these areas and absent in Valle de Janos, such as scrublands and pine-oak forest. However, if we compare the homogenous halophytic communities, such as the areas where prairie dogs inhabit the northeastern and northwestern regions of Mexico, we can see the northwestern halophytic communities support greater plant diversity (Table 4). A fairer comparison of the flora of the Valle de Janos is perhaps the halophytic grassland of northeastern Mexico (Estrada et al. 2010). In both grasslands Asteraceae, Poaceae, and Fabaceae are the dominant plant families, followed by others such as Cactaceae, Brassicaceae, and Solanaceae. Their diversity is low compared with other ecosystems (Rzedowski 1978); both grasslands are home to the prairie dog, *Cynomys mexicanus* (northeast grasslands) and *Cynomys ludovicianus* (northwest grasslands). Despite being similar in composition and structure, both grasslands show contrast in plant diversity: Valle de Janos has 14 families, 24 genera, and 102 species more than the northeast grasslands (53 families,

TABLE 4. Comparison of the flora in the Valle de Janos against regional floras of Chihuahua and one area from northeastern Mexico. Numbers in parentheses represent the number of shared taxa.

	Families	Genera	Species	Vegetation	Altitude (masl)
Valle de Janos	57	198	328	Grassland and scrublands	1380–1500
Central Chihuahua	112(51)	493(181)	1322(221)	Grassland and oak-pine forest	1450–2300
La Campana (Chih.)	74(43)	258(130)	433(124)	Grassland and oak-pine forest	1500–2500
Babícora (Chih.)	67(41)	244(93)	476(70)	Grassland and oak-pine forest	2150–2700
NE México	53(37)	174(92)	284(73)	Grassland and scrublands	1550–1950

174 genera, and 226 species) (Estrada et al. 2010). Both grasslands share *Dalea, Bouteloua, Opuntia, Aristida,* and *Atriplex* as the most diversified genera, and the herbaceous plants have the highest diversity, followed by shrubs and trees. There is a higher plant endemism in the northeast grasslands (17 species, 6%) than in the northwest ones (1, 0.003%). The influence of the different climate, altitude, topography, soil type, and the presence of endoergic basins in the northeast grasslands areas have undoubtedly favored this speciation phenomenon, compared to the relatively homogeneous landscape found in the northwest grasslands.

Endemism, growth forms, and flora origin

From the total flora, only fifteen of the species are endemic to the Chihuahuan Desert, including the State of Chihuahua and Valle de Janos grasslands (see Appendix I). Three of them are endemic only for the State of Chihuahua: *Matelea chihuahuensis*, *Opuntia orbiculata*, and *Dalea janosensis. Dalea janosensis* is a new species recently described for this area (Estrada et al. 2013) that was discovered as part of this work. It is associated only with halophytic communities comprised of *Sporoblus airoides*, *S. cryptandrus*, *Atriplex acanthocarpa*, *A. wrightii*, *A. canescens*, *Prosopis glandulosa* var. *torreyana*, *Malvella leprosa*, *Bouteloua aristidoides,* and *Ipomoea costellata.* According to the NOM-059-SEMARNAT-2010 (SEMARNAT 2010), only one of the species, *Amoreuxia palmatifida,* is protected (special protection, Pr). This species is found only in rocky and undulating ridges associated with *Artemisia frigida*, *Sphaeralcea wrightii*, *Tragia nepetifolia,* and *Heteropogon contortus.*

The total taxa include five growth forms: herbaceous (163 perennials, 106 annuals), shrubs (25 thornless and 8 thorny), fleshy stems (15), rosetophyllous (2), and trees (9). The most abundant annual species in the study area are *Aristida adscensionis*, *Bouteloua barbata*, *B. aristidoides,* and *Panicum hirticaule.* The most common perennial ones are *Pleuraphis mutica*, *Sporobolus airoides*, *Bouteloua eriopoda, B. gracilis, Bothriochloa barbinodis,* and *Aristida divaricata.* The most common annual forbs are *Atriplex wrightii*, *Eriogonum abertianum*, *Portulaca olearacea*, *Talinum aurantiacum*, and *Machaeranthera tanacetifolia.* The most common perennial forbs are *Salsola tragus, Machaeranthera pinnatifida*, *Sida abutifolia, Solanum elaeagnifolium,* and *Evolvulus alsinoides.* The dominant scrublands are comprised of *Prosopis glandulosa* var. *torreyana*, *Epherda trifurca*, *Atriplex canescens*, *Mimosa aculeaticarpa,* and *Ziziphus obtusifolia. Salix bonplandiana*, *Populus fremontii,* and *Platanus racemosa* are common in riparian areas. *Cylindropuntia imbricata*, *Opuntia macrorhiza* var. *macrorhiza*, *O. macrocentra,* and *Echinocereus rigidissimus* are the most common cacti. *Dasylirion wheeleri* and *Yucca elata* are scarce in the Valle de Janos, found only in the most arid areas.

Several species such as *Atriplex canescens, A. acanthocarpa, A. elegans, A. obovata, A. wrightii, Pleuraphis mutica, Sporobolus airoides, S. pyramidatus, Eragrostis mexicana,* and *E. neomexicana* are common in areas where sodium or sulfate salt concentrations are very high. These salty soils are frequent in the north of the study area, such as Rancho Las Arenillas and Rancho el Peñasco.

Where there are few hillocks, the topographic diversity highlights the presence of no-saline adpated species, including shrubs such as *Aloysia wrightii* and *Baccharis pteronioides*; grasses such as *Bouteloua curtipendula*, *Heteropogon contortus*, *Bouteloua eriopoda*, *Lycurus phleoides*, *Digitaria califórnica,* and *Aristida divaricata;* and forbs such as *Artemisia frigida*, *Sphaeralcea wrightii*, *Tragia nepetifolia*, *Commelina dianthifolia,* and *Amoreuxia palmatifida.*

In the Valle de Janos, native species (302 = 92.1%) are, by far, more diverse than the introduced ones (26 =

7.9%). Among the most frequent introduced species are *Salsola tragus*, *Chloris virgata*, *Chenopodium album*, *Schismus barbatus*, *Cyperus esculentus*, *Eragrostis cilianensis*, *Urochloa mutica*, and *Mollugo verticillata* (see "i" in Appendix I). Similarly, the native genera (191 = 96.4%) surpass those introduced (7 = 3.5%). The most frequent introduced genera are *Brassica*, *Eruca*, *Cynodon*, *Schismus*, and *Salsola*. These elements are very common in abandoned fields in the area. The most common growth forms are herbs (269 species = 82%), shrubs (33 = 10.1%), and trees (10 = 3%). We recorded 76 weed species (23.2% of the total flora), 56 native and 20 exotic ones (see "w" in Appendix I). The most frequent weed species in the area are *Salsola tragus*, *Sida abutifolia*, *Machaeranthera pinnatifida*, *Chloris virgata*, *Pectis prostrata*, *Chenopodium album*, *Amaranthus retroflexus*, *Mollugo verticillata*, *Evolvulus alsinoides*, and *Eragrostis cilianensis*. These species are more frequent in areas with exposure to livestock management (overgrazing) and agriculture (crops abandoned).

CONCLUSIONS

Valle de Janos supports rich plant diversity in spite of its relatively homogenous topography. Its characteristic plant associations are determined by the arid climate, the edaphic factors, and black-tailed prairie dog, allowing it the presence of that particular flora. Halophytic communities of northwestern Mexico have higher plant diversity but lower plant endemism than counterparts found in northeastern Mexico (Estrada et al 2010). When plant diversity of Valle de Janos is compared with several surrounding areas in the State of Chihuahua, it is less diverse, since this study counted only the species inhabiting the plains and excluded the oak and oak-pine forest. This study detected a large quantity of herbaceous species not recorded previously by general botanical studies (COTECOCA 1978). We recommend studies focused in ecology and exotic species replacement and establishment due to soil use and compaction as well as those focused in overgrazing since this ecosystem is currently highly transformed by agricultural activities. The most common grasses such as *Aristida adscensionis*, *Bouteloua barbata*, *B. aristidoides*, *Panicum hirticaule*, and *Bothriochloa barbinodis* and some herbs such as *Sida abutifolia*, *Machaeranthera pinnatifida*, *M. tanacetifolia*, *Solanum elaeagnifolium*, and *Evolvulus alsinoides* are disturbance indicator plants and are classified as weeds (CONABIO 2013), coupled with some exotic species such as *Salsola tragus*, *Mollugo verticillata*, and *Chloris virgata* (Villaseñor & Espinosa-Garcia 2004).

The capabilities of the plant species to tolerate drought and salinity are causal factors for the presence of species and communities in different habitat, and the minimum xylem pressure potential are indicative of drought tolerance, and the minimum cell osmotic potential are indicative of the tolerance of plant species to salinity (Branson et al 1988). Several species found in this area such as *Atriplex obovata*, *A. canescens*, *Ephedra trifurca*, *Gutierrezia sarothrae*, *Krascheninnikovia lanata*, *Larrea tridentata*, *Prosopis glandulosa* var. *torreyana*, and *Sporobolus airoides*. There are over 2,000 known plant species worldwide that have some tolerance to salinity (Menzel & Lieth 2003); 27 of them are found in the Valle de Janos, and the most outstanding ones in decreasing order with respect to tolerance of salts are *Atriplex canescens*, *Sporobolus airoides*, *Chenopodium album*, *Prosopis glandulosa* var. *torreyana*, and *Salsola tragus*. At least 60 species found in the Valle de Janos are included into the USDA-ARS data bases (Yensen 2013) as salt-tolerant plants.

The most common forbs associated are *Atriplex wrightii*, *Eriogonum abertianum*, *E. abertianum Machaeranthera pinnatifida*, *M. tanacetifolia*, *Portulaca oleracea*, *Salsola tragus*, *Sida abutifolia*, *Solanum elaeagnifolium*, *Talinum aurantiacum*, *Zinnia grandiflora*, and several species of the genus *Euphorbia*. It is common to find patches of *Pleuraphis mutica* in areas where Haplic Yeromozol soils (high calcium contents) are present; it is a species that grows in environments with moderately saline soils and soils with calcium carbonate, very resistant to fire and drought (USFS 2014). Several arboreal and shrub species such as *Baccharis salicifolia*, *B. sarothroides*, *Platanus racemosa*, *Populus fremontii*, and *Salix bonplandiana* are frequently found in flat or gently rolling relief with Haplic Foezem soils. The Yermozol and Solonchak soils are most common at the north-central part of the study area and support mainly *Pleuraphis mutica-Sporobolus airoides-Atriplex* spp., as well as *S. pyramidatus*. This last species is common in salt meadows in Louisiana (Reid et al 2010). According to Rzewdoski (1978) and COTECOCA (1978), the most important grasses in Valle de Janos in the late 70s and early 80s were *Bouteloua gracilis*, *B. eripoda*, *B. hirsuta*, *B. curtipendula*, and *Aristida divaricata*. This can give an idea of

the species replacement, although the extent of it is still unknown. With respect to the main grasses (*Pleuraphis mutica* and *Sporobolus airoides*) in the halophytic communities, the plant physiognomy is almost the same, but the species composition is different. The discovery of a new taxon (*Dalea janosensis*) could imply a new conservation scheme in this unique halophytic community in the arid land of the Chihuahuan Desert. Last, we recommend promoting studies in plant diversity in the surrounding regions to complete the total flora of this interesting and unique area in Mexico.

APPENDIX 1

List of families, genera and species recorded in the Valle de Janos, Chihuahua, Mexico. H.V.M. = Humberto Vega Mares and collection number. Biological growth forms (**t** = tree, **s** = shrub, **h** = herbaceous, **f** = fleshy stems, and **r** = rosetophyllous). Native (**n**), introduced (**i**), weeds (**w**). Endemic to the Chihuahuan Desert (*), endemic for the State of Chihuahua (•), and endemic to the Valle de Janos (§).

FERNS

Pteridaceae

Astrolepis cochisensis (Goodd) D.M. Benham & Windham ssp. *cochisensis* (Goodd.) D.M. Benham & Windham, H.V.M. 1796; h, n

GYMNOSPERMS

Ephedraceae

Ephedra trifurca Torr. ex S. Watson, H.V.M. 1900; s, n

MONOCOTYLEDONS

Asparagaceae

Dasylirion wheeleri S. Watson ex Rothr., H.V.M. 1921; r, n
Yucca elata (Engelm.) Engelm., H.V.M. 1914; r, n

Amaryllidaceae

Allium kunthii G. Don, H.V.M. 1916; h, n

Commelinaceae

Commelina dianthifolia Delile, H.V.M. 1655; h, n

Cyperaceae

Carex filifolia Nutt., H.V.M. 1531; h, n
Cyperus dipsaceus Liebm., H.V.M. 1595; h, n
Cyperus esculentus L., H.V.M. 1679; h, i, w

Poaceae

Aristida adscensionis L., H.V.M. 1562: h, n, w
Aristida divaricata Humb. & Bonpl. ex Willd., H.V.M. 1584; h, n
Aristida havardii Vasey, H.V.M. 1583; h
Aristida pansa Woot. & Standl., H.V.M. 1482, 1604; h, n
Aristida purpurea Nutt. var. *longiseta* (Steud.) Vasey, H.V.M. 1700; h, n
Aristida schiedeana Trinius & Ruprecht, H.V.M. 1784; h, n
Bothriochloa barbinodis (Lag.) Herter, H.V.M. 1489; h, n
Bouteloua aristidoides (Kunth) Griseb., H.V.M. 1526; h, n
Bouteloua barbata Lag., H.V.M. 1458; h, n
Bouteloua curtipendula (Michx.) Torr., H.V.M. 1571; h, n
Bouteloua eriopoda (Torr.) Torr., H.V.M. 1498; h, n
Bouteloua gracilis (Kunth) Lag. ex Griffiths, H.V.M. 1543; h, n
Bouteloua hirsuta Lag., H.V.M. 1462,1703; h, n
Bouteloua parryi (E. Fourn.) Griffiths, H.V.M. 1785; h, n
Bouteloua rothrockii Vasey, H.V.M. 1606; h, n
Bromus anomalus Rupr. ex Fourn., H.V.M. 1786; h, n
Cenchrus incertus M.A. Curtis, H.V.M. 1663; h, n, w
Cenchrus spinifex Cav., H.V.M. 1788; h, n, w
Chloris virgata Sw., H.V.M. 1563; h, i, w
Cynodon dactylon (L.) Pers., H.V.M. 1789; h, i, w
Dasyochloa pulchella (Kunth) Willd. ex Rydb., H.V.M. 1597; h, n
Digitaria californica (Benth.) Henr., H.V.M. 1540; h, n
Digitaria sanguinalis (L.) Scop., H.V.M. 1733; h, i, w
Echinochloa colona (L.) Link, H.V.M. 1725; h, i, w
Echinochloa crusgalli (L.) P. Beauv., H.V.M. 1724; h, i, w
Elyonurus barbiculmis Hack., H.V.M. 1790; h, n, m
Enneapogon desvauxii P. Beauv., H.V.M. 1664; h, n, m
Eragrostis cilianensis (All.) Link ex Vignolo, H.V.M. 1525; h, i, w
Eragrostis lehmanniana Nees, H.V.M. 1607; h, i, w
Eragrostis mexicana (Hornem.) Link, H.V.M. 1560; h, n, w
Eragrostis neomexicana Vasey ex L.H. Dewey, H.V.M. 1561; h, n
Eriochloa gracilis (E. Fourn.) Hitchc., H.V.M. 1723; h, n
Erioneuron avenaceum (Kunth) Tateoka, H.V.M. 1653; h, n
Heteropogon contortus (L.) P. Beauv. ex Roem. & Schult., H.V.M. 1652; h, n
Leptochloa dubia (Kunth) Nees, H.V.M. 1612; h, n, w
Leptochloa filiformis (Pers.) P. Beauv., H.V.M. 1588; h, n, w
Lycurus phleoides Kunth, H.V.M. 1791; h, n, w
Muhlenbergia arenacea (Buckley) Hitchc, H.V.M. 1651; h
Muhlenbergia arenicola Buckley, H.V.M. 1699; h, n
Muhlenbergia monticula Buckley, H.V.M. 1792; h, n
Muhlenbergia porteri Scribn. ex Beal, H.V.M. 1603; h, n
Muhlenbergia rigens (Benth.) Hitchc., H.V.M. 1800: h, n
Panicum hirticaule J. Presl, H.V.M. 1564; h, n
Panicum obtusum Kunth, H.V.M. 1585; h, n
Pleuraphis mutica Buckley, H.V.M. 1463; h, n
Schismus arabicus Nees, H.V.M. 1792; h, i, w
Schismus barbatus (L.) Thell., H.V.M. 1678,1726; h, i, w
Scleropogon brevifolius Phil., H.V.M. 1593; h, n, w
Setaria grisebachii E. Fourn., H.V.M. 1605; h, n, w
Setaria leucopila (Scribn. & Merr.) K. Schum., H.V.M. 1673; h, n, w
Sorghum halepense (L.) Pers., H.V.M. 1539; h, i, w
Sporobolus airoides (Torr.) Torr., H.V.M. 1799; h, n
Sporobolus contractus Hitchc., H.V.M. 1608; h, n
Sporobolus cryptandrus (Torr.) A. Gray, H.V.M. 1794; h, n
Sporobolus flexuosus (Thurb. ex Vasey) Rydb., H.V.M. 1702; h, n
Sporobolus pyramidatus (Lam.) Hitchc., H.V.M. 1623; h, n
Tragus berteronianus Schult., H.V.M. 1602; h, i, w
Tridens muticus (Torr.) Nash, H.V.M. 1714; h, n
Urochloa arizonica (Scribn. & Merr.) Morrone & Zuloaga, H.V.M. 1657; h, n
Urochloa mutica (Forssk.) T.Q. Nguyen, H.V.M. 1930; h, i, w

DICOTYLEDONS

Aizoaceae

Trianthema portulacastrum L., H.V.M. 1919; h, n, w

Amaranthaceae

Amaranthus blitoides S. Watson, H.V.M. 1709; h, n
Amaranthus retroflexus L., H.V.M. 1918; h, n, w
**Froelichia arizonica* Thornber ex Standl., H.V.M. 1596; h, n
Gomphrena nitida Rothr., H.V.M. 1593; h, n
Guilleminea densa (Humb. & Bonpl. ex Schult.) Moq., H.V.M. 1544; h, n, w
Tidestromia lanuginosa (Nutt.) Standl., H.V.M. 1917; h, n

**Tidestromia suffruticosa* (Torr.) Standl., H.V.M. 1513; h, n

Anacardiaceae

Rhus microphylla Engelm. ex A., H.V.M. 1600; s, n

Apocynaceae

Apocynum androsaemifolium L., H.V.M. 1920; h, n
Asclepias asperula (Decne.) Woodson, H.V.M. 1530; h, n
Asclepias latifolia (Torr.) Raf., H.V.M. 1512; h, n
Asclepias oenotheroides Schltdl. & Cham., H.V.M 1749; h, n
Asclepias subverticillata (A. Gray) Vail, H.V.M. 1717; h, n
•Matelea chihuahuensis (A. Gray) Woodson, H.V.M. 1736; h, n
Sarcostemma cynanchoides Decne. ssp. *hartwegii* (Vail) R. Holm, H.V.M. 1915; h, n

Aristolochiaceae

Aristolochia longecaudata S. Watson, H.V.M. 1568; h, n
**Aristolochia wrightii* Seem., H.V.M. 1701; h, n

Asteraceae

Acourtia nana (A. Gray) Reveal & R. M. King, H.V.M. 1519; h, n
Ambrosia artemisiifolia L., H.V.M. 1559; h, i, w
Ambrosia confertiflora DC., H.V.M. 1627; h, n, w
Aphanostephus ramosissimus DC. var. *humilis* (Benth.) B.L.Turner & Birdsong, H.V.M. 1743; h, n, w
Artemisia frigida Willd., H.V.M. 1594; h, n
Artemisia ludoviciana Nutt., H.V.M. 1750; h, n, w
Baccharis pteronioides DC., H.V.M. 1670; s, n
Baccharis salicifolia (Ruiz & Pav.) Pers., H.V.M. 1537; s, n
Baccharis sarothroides A. Gray, H.V.M. 1719; s, n
Bahia absinthifolia Benth., H.V.M. 1613; h, n, w
Bahia autumnalis Ellison, H.V.M. 1738; h, n
Bahia pedata A. Gray, H.V.M. 1913; h, n
Baileya multiradiata Harv. & A. Gray ex A. Gray, H.V.M. 1570; h, n
Berlandiera lyrata Benth., H.V.M. 1527; h, n
Bidens bigelovii A. Gray, H.V.M. 1694; h, n, w
Brickellia eupatorioides (L.) Shinners var. *chlorolepis* (Wooton & Standl.) B.L.Turner, H.V.M. 1741; h, n
Brickellia lemmonii A.Gray var. *conduplicata* (B.L. Rob.) B.L. Turner, H.V.M. 1730; h, n
Chaetopappa bellioides (A. Gray) Shinners, H.V.M. 1912; h, n
Chaetopappa ericoides (Torr.) G.L. Nesom, H.V.M. 1640 y 1739; h, n
Cirsium texanum Buckley, H.V.M. 1485; h, n
Conoclinium greggii (A. Gray) Small, H.V.M. 1574; h, n
**Flourensia cernua* DC., H.V.M. 1599; s, n
Grindelia squarrosa (Pursh) Dunal, H.V.M. 1630; h, n
Gutierrezia microcephala (DC.) A. Gray, H.V.M. 1922; s, n
Gutierrezia sarothrae (Pursh) Britton & Rusby, H.V.M. 191; s, n
Helianthus ciliaris DC., H.V.M. 1506; h, n, w
Helianthus petiolaris Nutt., H.V.M. 1751; h, n
Heliomeris longifolia (B.L. Rob. & Greenm.) Cockerell, H.V.M. 1923; h, n
Heterotheca subaxillaris (Lam.) Britton & Rusby, H.V.M. 1545; h, n
Hymenoxys richardsonii (Hook.) Cockerell, H.V.M. 1910; h, n
Laennecia coulteri (A. Gray) G.L. Nesom, *H.V.M* 1536; h, n
Leuciva dealbata (A. Gray) Rydb., H.V.M. 1616; h, n, w
Machaeranthera pinnatifida (Hook.) Shinners, H.V.M. 1481; h, n, w
Machaeranthera tanacetifolia (Kunth) Nees, H.V.M. 1508; h, n
Parthenium incanum Kunth, H.V.M. 1541; s, n
Pectis papposa Harv. & A. Gray, H.V.M. 1677; h, n
Pectis prostrata Cav., H.V.M. 1618; h, n, w
Porophyllum ruderale (Jacq.) Cass., H.V.M. 1695; h, n
Psilactis asteroides A. Gray, H.V.M. 1742; h, n, w
Psilostrophe tagetina (Nutt.) Greene, H.V.M. 1549; h, n
Sanvitalia abertii A. Gray, H.V.M. 1547; h, n
Senecio flaccidus Less. var. *douglasii* (DC.) B.L. Turner & T.M. Barkley, H.V.M. 1509; h, n
Senecio longilobus Benth., H.V.M. 1517; s, n, w
Stephanomeria pauciflora (Torr.) A. Nelson, H.V.M. 1516; h, n
Thelesperma megapotamicum (Spreng.) Kuntze, H.V.M. 1478; h, n
Thymophylla acerosa (DC.) Strother, H.V.M. 1636; h, n
**Thymophylla aurea* (A. Gray) Greene var. *polychaeta* (A. Gray) Strother, H.V.M. 1617; h, n
Tithonia tubiformis (Jacq.) Cass., H.V.M. 1740; h, n, w
Trixis californica Kellogg, H.V.M. 1671; s, n
Verbesina encelioides (Cav.) Benth. & Hook. f. ex A. Gray, H.V.M. 1518; h, n, n
Viguiera cordata (Hook. & Arn.) D'Arcy, H.V.M. 1737; h, n
Viguiera linearis (Cav.) Sch.Bip. ex Hemsl., H.V.M. 1747; h, n, w
Xanthisma gracile (Nutt.) D.R. Morgan & R.L. Hartm., H.V.M. 1936; h, n
Xanthium strumarium L., H.V.M. 1909; h, n
Zinnia grandiflora Nutt., H.V.M. 1484; h, n

Bignoniaceae

Chilopsis linearis (Cav.) Sweet, H.V.M. 1689; t, n

Bixaceae

Amoreuxia palmatifida DC. H.V.M. 1665; h, n

Boraginaceae

Cryptantha cinerea (Greene) Cronquist, H.V.M. 1643; h, n
Cryptantha micrantha (Torr.) I.M. Johnst., H.V.M. 1752; h, n
Nama hispida A. Gray, H.V.M. 1908; h, n

Brassicaceae

Brassica rapa L., H.V.M. 1690; h, i, w
Brassica tournefortii Gouan, H.V.M. 1674; h, i, w
Descurainia pinnata (Walter) Britton, H.V.M. 1907; h, n, w
Dimorphocarpa wislizeni (Engelm.) Rollins, H.V.M. 1669; h, n
Eruca sativa (L.) Mill., H.V.M. 1727; h, i, w
Lepidium lasiocarpum Nutt., H.V.M. 1460; h, n
Lepidium montanum Nutt., H.V.M. 1460; h, n
Lepidium virginicum L., H.V.M. 1924; h, n, w
Physaria gordonii (A. Gray) O'Kane & Al-Shehbaz, H.V.M. 1935; h, n

Cactaceae

Echinocereus fendleri (Engelm.) Sencke ex J.N. Haage var. *fendleri*, H.V.M. 1906; f, n
**Echinocereus rigidissimus* (Engelm.) F. Haage., H.V.M. 1753; f, n
**Coryphantha scheeri* (Kuntze) L.D. Benson var. *robustispina* (Schott ex Engelm.) L.D. Benson, H.V.M. 1925; f, n
Cylindropuntia imbricata (Haw.) F. M. Kunth, H.V.M. 1926; f, n
Mammillaria heyderi Muehlenpf., H.V.M. 1934; f, n
Opuntia discata Griffiths, H.V.M. 1904; f, n
Opuntia macrocentra Engelm., H.V.M. 1939; f, n
Opuntia macrorhiza Engelm.var. *macrorhiza*, H.V.M. 1927; f, n
Opuntia macrorhiza Engelm. var. *pottsii* (Salm-Dyck) L.D. Benson, H.V.M. 1938; f, n
•Opuntia orbiculata Salm-Dyck ex Pfeiff., H.V.M. 1903; f, n
Opuntia polyacantha Haw. var. *trichophora* (Engelm. & J.M. Bigelow) J.M. Coult., H.V.M. 1928; f, n
Opuntia spinosior (Engelm.) Toumey, H.V.M. 1933; f, n
Thelocactus bicolor (Galeotti) Britton & Rose var. *bicolor*, H.V.M. 1902; f, n

Chenopodiaceae

Atriplex acanthocarpa (Torr.) S. Watson, H.V.M. 1619; a
Atriplex canescens (Pursh) Nutt., H.V.M. 1503; s, n
Atriplex elegans (Moq.) D. Dietr. H.V.M. 1469; s, n
Atriplex obovata Moq., H.V.M. 1620; s, n
Atriplex wrightii S. Watson, H.V.M. 1631; h, n
Chenopodium album L., H.V.M. 1502; h, i, w
Krascheninnikovia lanata (Pursh) A.D.J. Meeuse & Smith, H.V.M. 1504; s, n
Salsola tragus L., H.V.M. 1634; h, i, w

Convolvulaceae
Convolvulus equitans Benth., H.V.M. 1656; h, n
Dichondra argentea Humb. & Bonpl. ex Willd., H.V.M. 1491; h, n, w
Evolvulus alsinoides (L.) L, H.V.M. 1488; h, n, w
Evolvulus sericeus Sw., H.V.M. 1487; h, n
Ipomoea costellata Torr., H.V.M. 1582; h, n
Ipomoea cristulata Hallier f., H.V.M. 1686; h, n

Crassulaceae
Sedum wrightii A. Gray, H.V.M. 1754; h, f

Cucurbitaceae
Apodanthera undulata A. Gray, H.V.M. 1468; h, n, w
Cucurbita digitata A. Gray, H.V.M. 1467; h, n
Cucurbita foetidissima Kunth, H.V.M. 1901; h, n, w
Ibervillea tenuisecta (A. Gray) Small, H.V.M. 1644; h, n

Ericaceae
Arbutus xalapensis Kunth, H.V.M. 1755; t, n

Euphorbiaceae
Acalypha neomexicana Müll. Arg., H.V.M. 1713; h, n
Acalypha ostryifolia Riddell, H.V.M. 1587; h, n
Argythamnia humilis (Engelm. & A. Gray) Müll. Arg. var. *humilis*, H.V.M. 1745; h, n
Argythamnia neomexicana Mull. Arg., H.V.M. 1661; h, n
Croton pottsii (Klotzsch) Müll. Arg., H.V.M. 1712; h, n
Croton suaveolens Torr., H.V.M. 1633; h, n
Euphorbia albomarginata Torr. & A. Gray, H.V.M. 1459; h, n
Euphorbia capitellata Engelm., H.V.M. 1464; h, n
Euphorbia cinereascens Engelm., H.V.M. 1889; h, n
Euphorbia davidii Subils, H.V.M. 1591; h, n, w
Euphorbia dentata Michx., H.V.M. 1554; h, n, w
Euphorbia dioeca Kunth, H.V.M. 1721; h, n, w
Euphorbia exstipulata Engelm., H.V.M. 1555; h, n
Euphorbia heterophylla L. H.V.M. 1522; h, n
Euphorbia hyssopifolia L., H.V.M. 1580; h, n, w
Euphorbia micromera Engelm., H.V.M. 1720; h, n
Euphorbia setiloba Engelm. ex Torr., H.V.M. 1680; h, n
Euphorbia serpyllifolia Pers., H.V.M. 1579; h, n
Euphorbia stictospora Engelm., H.V.M. 1888; h, n
Euphorbia tomentulosa S. Watson, H.V.M. 1685; h, n
Jatropha macrorhiza Benth., H.V.M. 1465; h, n
Tragia ramosa Torr., H.V.M. 1756; h, n

Fabaceae
Acacia angustissima (Mill.) Kuntze, H.V.M. 1471; s, n
Astragalus crassicarpus Nutt., H.V.M. 1632; h, n
Astragalus mollissimus Torr., H.V.M. 1470; h, n, w
Astragalus nuttalianus DC., H.V.M. 1698; h, n
Astragalus sp., H.V.M. 1722; h, n
Caesalpinia jamesii (Torr. & A. Gray) Fisher, H.V.M. 1472; h, n
Chamaecrista nictitans (L.) Moench, H.V.M. 1494; h, n
Crotalaria pumila Ortega, H.V.M. 1550; h, n, w
Dalea brachystachys A.Gray, H.V.M. 1691; h, n
Dalea candida Willd. var. *oligophylla* (Torr.) Shinners, H.V.M. 1635; h, n
Dalea formosa Torr., H.V.M. 1641; s, n
Dalea jamesii (Torr.) Torr. & A. Gray, H.V.M. 1705; h, n
§*Dalea janosensis* A.E. Estrada, Villarreal & H. Vega, H.V.M. 1675; h, n
Dalea nana Torr. var. *nana*, H.V.M. 1704; h, n
Dalea pogonathera A. Gray, H.V.M. 1565; h, n
Dalea polygonoides A. Gray, H.V.M. 1575; h, n
Desmodium neomexicanum A. Gray, H.V.M. 1598; h, n
Eysenhardtia spinosa Engelm., H.V.M. 1887; s, n
Hoffmannseggia glauca (Ortega) Eifert, H.V.M. 1493; h, n, w
Macroptilium gibbosifolium (Ortega) A. Delgado, H.V.M. 1457; h, n, w
Mimosa aculeaticarpa Ortega, H.V.M. 1505; s, n
Mimosa dysocarpa Benth., H.V.M. 1886; s, n
Prosopis glandulosa var. *torreyana* Torr., H.V.M. 1495; s, n
Rhynchosia senna Gillies ex Hook. & Arn., H.V.M. 1535; h, n
Rhynchosia senna Gillies ex Hook. & Arn. var. *angustifolia* (A. Gray) Grear, H.V.M. 1704; h, n
Senna bauhinioides (A. Gray) H.S. Irwin & Barneby, H.V.M. 1520; h, n
Senna durangensis (Rose) H.S. Irwin & Barneby var. *durangensis*, H.V.M. 1490; h, n
Senna lindheimeriana (Scheele) H. S. Irwin & Barneby, H.V.M. 1521; s, n

Fouquieriaceae
Fouquieria splendens Engelm., H.V.M. 1758; s, n

Geraniaceae
Erodium cicutarium (L.) L'Hér. ex Ait., H.V.M. 1885; h, i, w

Hydrophyllaceae
Phacelia crenulata Torr. ex S. Watson, H.V.M. 1984; h, n

Krameriaceae
Krameria lanceolata Torr., H.V.M. 1639; h, n

Lamiaceae
Salvia arizonica A. Gray, H.V.M. 1734; h, n
Salvia pinguifolia (Fernald) Wooton & Standl., H.V.M. 1883; s, n
**Salvia subincisa* Benth., H.V.M. 1589; h, n
Tetraclea coulteri A. Gray, H.V.M. 1557 y 1628; h, n

Linaceae
Linum aristatum Engelm., H.V.M. 1466; h, n

Loasaceae
Cevallia sinuata Lag., H.V.M. 1667; h, n
Mentzelia multiflora (Nutt.) A. Gray, H.V.M. 1507; h, n

Malpiguiaceae
Janusia gracilis A.Gray, H.V.M. 1610; s, n

Malvaceae
Abutilon palmeri A. Gray, H.V.M. 1609; s, n
Abutilon parvulum A.Gray, H.V.M. 1746; h, n
Abutilon wrightii A. Gray, H.V.M. 1515; h, n
Anoda cristata (L.) Schltdl., H.V.M. 1552; h, n, w
Anoda thurberi A.Gray, H.V.M. 1744; h, n
Hibiscus denudatus Benth., H.V.M. 1659; s, n
Krascheninnikovia lanata (Pursh) A. Meeuse & A. Smith; H.V.M. 1435; h, n
Malvella leprosa (Ortega) Krapov., H.V.M. 1497; h, n
Rhynchosida physocalyx (A. Gray) Fryxell, H.V.M. 1601; h, n
Sida abutiifolia Mill., H.V.M. 1650; h, n, w
Sphaeralcea angustifolia (Cav.) G. Don, H.V.M. 1715; h, n, w
Sphaeralcea coccinea (Nutt.) Rydb., H.V.M. 1759; h, n
Sphaeralcea hastulata A. Gray, H.V.M. 1625; h, i, w
**Sphaeralcea wrightii* A. Gray, H.V.M. 1666; h

Martyniaceae
Proboscidea louisianica (Mill.) Thell., H.V.M. 1780; h, n, w

Molluginaceae
Mollugo verticillata L., H.V.M. 1499; h, i, w

Moraceae
Morus nigra L., H.V.M. 1687; t, i, w

Nyctaginaceae
**Acleisanthes chenopodioides* (A. Gray) R.A. Levin, H.V.M. 1556; h, n
Allionia incarnata L., H.V.M. 1542; h, n
Allionia incarnata L. var. *villosa* (Standl.) B.L.Turner, H.V.M. 1572; h, n
Boerhavia erecta L., H.V.M. 1682: h, n, w
Boerhavia gracillima Heimerl, H.V.M. 1662; h, n

Boerhavia intermedia M.E. Jones, H.V.M. 1524; h, n
Boerhavia wrightii A. Gray, H.V.M. 1496 y 1546; h, n
Mirabilis longiflora L., H.V.M. 1629; h, n
Mirabilis multiflora (Torr.) A.Gray, H.V.M. 1626; h, n

Oleaceae
Menodora scabra A. Gray, H.V.M. 1735; h

Onagraceae
Gaura coccinea Pursh, H.V.M. 1477 y 1528; h
Gaura mollis Kunth, H.V.M. 1716; h
Oenothera dissecta A. Gray, H.V.M. 1693; h
Oenothera primiveris A. Gray, H.V.M. 1781; h
Oenothera sp., H.V.M. 1782; h

Orobanchaceae
Orobanche cooperi (A. Gray) A. Heller, H.V.M. 1882; h

Oxalidaceae
Oxalis stricta L., H.V.M. 1681; h, n

Papaveraceae
Argemone pleiacantha Greene, H.V.M. 1929; h, n
Eschscholzia californica Cham., H.V.M. 1881; h, n

Plantaginaceae
Penstemon fendleri Torr. & A. Gray, H.V.M. 1783; h, n
Plantago patagonica Jacq., H.V.M. 1480; h, n

Platanaceae
Platanus racemosa Nutt. var. *wrightii* (S. Watson) L. D. Benson, H.V.M. 1534; t, n

Polemoniaceae
Giliastrum rigidulum (Benth.) Rydb., H.V.M. 1642; h, n

Polygalaceae
Polygala obscura Benth., H.V.M. 1523 y 1529; h, n

Polygonaceae
Eriogonum abertianum Torr., H.V.M. 1624, 1647 y 1729; h, n
Eriogonum polycladon Benth., H.V.M. 1567; h, n
**Eriogonum rotundifolium* Benth., H.V.M. 1614; h, n
Eriogonum wrightii Torr. ex Benth., H.V.M. 1510; h, n
Persicaria maculosa A. Gray, H.V.M. 1648; h, i, w
Rumex crispus L., H.V.M. 1795; h, i, w
Rumex hymenosepalus Torr., H.V.M. 1931; h, n

Portulacaceae
Portulaca halimoides L., H.V.M. 1932; h, n
Portulaca oleracea L., H.V.M. 1798; h, n, w
Portulaca pilosa L., H.V. M. 1501; h, n w
Portulaca umbraticola Kunth, H.V.M. 1492; h, n
Talinum aurantiacum Engelm., H.V.M. 1466, 1476; h, n

Rhamnaceae
Ziziphus obtusifolia (Hook. ex Torr. & A. Gray) A. Gray, H.V.M. 1461; s, n

Rosaceae
Fallugia paradoxa (D. Don) Endl. ex Torr., H.V.M. 1731; ,s, n

Salicaceae
Populus fremontii S. Watson, H.V.M. 1532; t, n
Salix bonplandiana Kunth, H.V.M. 1533; t, n

Sapindaceae
Sapindus saponaria L. var. *drummondii* (Hook. & Arn.) L.D. Benson, H.V.M. 1649; t, n

Solanaceae
Chamaesaracha coronopus (Dunal) A. Gray, H.V.M. 1710; h, n
Chamaesaracha pallida Averett, H.V.M. 1645; h. n
**Datura ceratocaula* Ortega, H.V.M. 1668; h, n, w
Datura quercifolia Kunth, H.V.M. 1578; h, n, w
Lycium pallidum Miers, H.V.M. 1615; s, n
Lycium torreyi A. Gray, H.V.M. 1684; s, n
Nicotiana trigonophylla Dunal, H.V.M. 1660; s, n, w
Physalis acutifolia (Miers) Sandwith, H.V.M. 1586; h, n, w
Solanum elaeagnifolium Cav., H.V.M. 1479; h, n w
Solanum heterodoxum Dunal, H.V.M. 1538; h, n, w
Solanum jamesii Torr., H.V.M. 1676; h, n
Solanum rostratum Dunal, H.V.M. 1718; h, n, w

Ulmaceae
Celtis reticulata Torr., H.V.M. 1511; t, n

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